SOLID STATE OPTRONICS

SMQ4110

Quad 1 Form A
250V / 300Ω
MOSFET Output Solid State Relay

Description

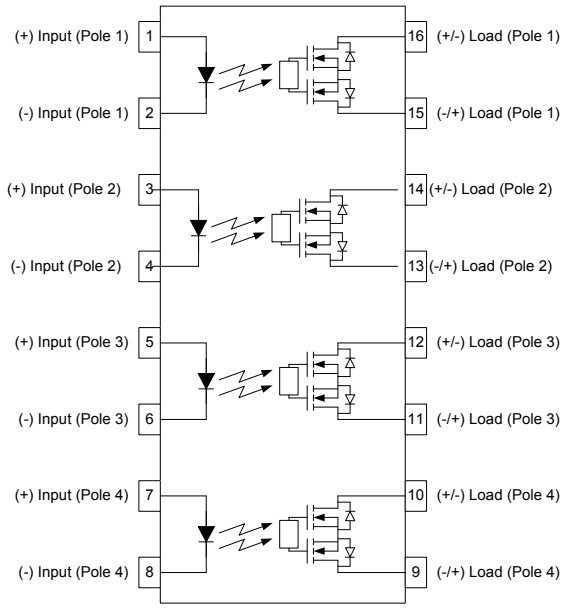
The SMQ4110 is a bi-directional, quad-pole, single-throw, normally open MOSFET output solid-state relay. This device offers four discrete and independently controlled optically isolated SSRs in one miniature 16 pin SOIC package. Each discrete relay consists of an infrared LED, optically coupled to a Photo Diode Array, which in turn drives a pair of back-to-back enhancement MOSFETs. The output structures offer very fast switching speeds (50μS TYP) and very low leakage current (10nA TYP).

The SMQ4110 comes standard in a 16 SOIC package.

Applications

- Data Acquisition
- Meter Reading Systems
- Medical Equipment
- Battery Monitoring
- Multiplexers

Schematic Diagram



SMQ4110

Features

- Quad Pole Switching / Small 16 SOIC Package
- Fast Turn On Speed (<50μS TYP)
- Ultra Low Leakage Current (<10nA TYP)
- 40mA Maximum Continuous Load Current
- High Isolation Voltage (2.5kV$_{RMS}$)
- Long Life / High Reliability
- RoHS / Pb-Free / REACH Compliant

Agency Approvals

UL / C-UL:	File # E201932
VDE:	File # 40035191 (EN 60747-5-2)

Absolute Maximum Ratings

The values indicated are absolute stress ratings. Functional operation of the device is not implied at these or any conditions in excess of those defined in electrical characteristics section of this document. Exposure to absolute Maximum Ratings may cause permanent damage to the device and may adversely affect reliability.

Storage Temperature	-55 to +125°C
Operating Temperature	-40 to +85°C
Continuous Input Current	40mA
Transient Input Current	400mA
Reverse Input Control Voltage	5V
Input Power Dissipation	70mW
Total Power Dissipation	500mW
Solder Temperature – Wave (10sec)	260°C
Solder Temperature – IR Reflow (10sec)	260°C

Ordering Information

Part Number	Description
SMQ4110	16 pin SOIC, (46/Tube)
SMQ4110-TR	16 pin SOIC, Tape and Reel (1000/Reel)

NOTE: Suffixes listed above are not included in marking on device for part number identification

Electrical Characteristics, T_A = 25°C (unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Input Specifications						
LED Forward Voltage	V_F	-	1.2	1.5	V	I_F = 10mA
LED Reverse Voltage	BV_R	5	-	-	V	I_R = 10μA
Turn-On Current (LED Trigger)	I_F	-	2.5	5	mA	I_O = 40mA
Turn-Off Current	I_{FOFF}	-	0.5	-	mA	I_O = 40mA
Terminal Capacitance	C_t	-	30	-	pF	V=0, f=1MHz
Output Specifications						
Blocking Voltage	V_B	250	-	-	V	I_F=0mA, I_O=1μA
Continuous Load Current	I_O	-	-	40	mA	I_F=5mA
On Resistance	R_{ON}	-	225	300	Ω	I_F=5mA, I_O=40mA
Leakage Current	I_{Oleak}	-	10	100	nA	V_O=250V
Output Capacitance	C_{OUT}	-	1.5	-	pF	I_F=0mA, f=1.0MHz
Offset Voltage	V_{OFFSET}	-	-	0.2	mV	I_F=5mA
Coupled Specifications						
Turn-On Time	T_{ON}	-	50	500	μS	I_F=5mA, I_O=40mA
Turn-Off Time	T_{OFF}	-	150	500	μS	I_F=0mA, I_O=40mA
Input to Output Capacitance	C_S	-	3	-	pF	V=0, f=1MHz
Contact Transient Ratio	-	2,000	7,000	0	V/μS	dV = 50V
Isolation Specifications						
Isolation Voltage	V_{ISO}	2500	-	-	V_{RMS}	RH ≤ 50%, t=1min
Input-Output Resistance	R_{I-O}	-	10^{12}	-	Ω	RH ≤ 50%, V_{I-O} = 500V_{DC}

SMQ4110 Performance & Characteristics Plots, T_A = 25°C (unless otherwise specified)

Figure 1: *Typical Turn-On Time Distribution* (N = 100, T_a = 25ºC)

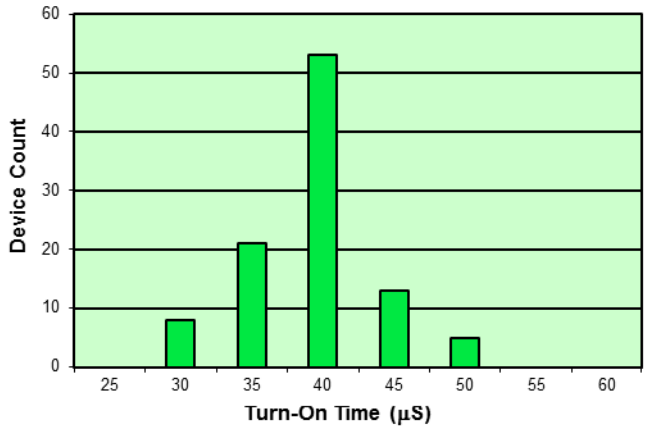


Figure 2: *Typical Turn-Off Time Distribution* (N = 100, T_a = 25ºC)

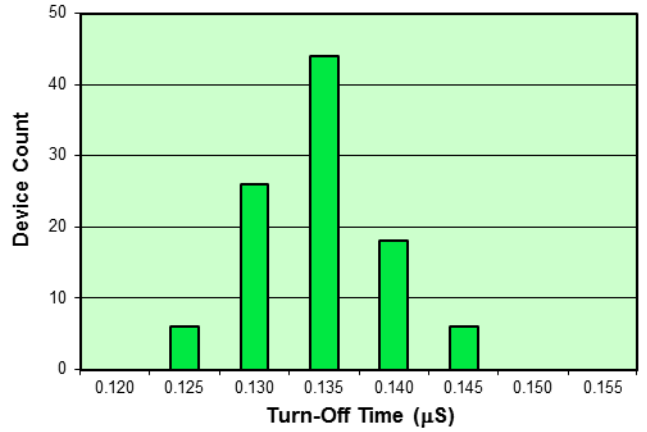


Figure 3: *Typical On-Resistance Distribution* (N = 100, T_a = 25ºC)

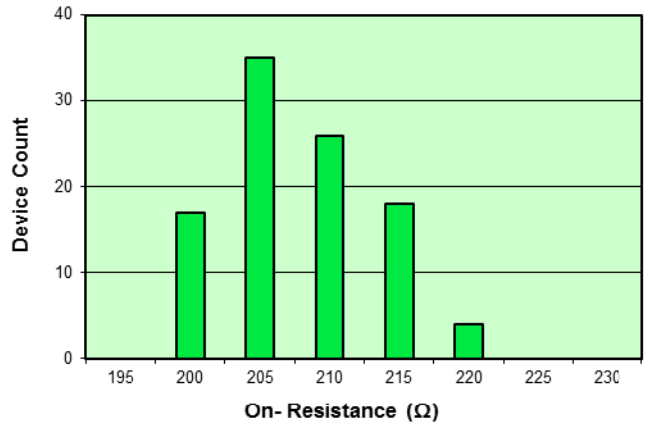


Figure 4: *Typical Output Leakage Current Distribution* (N = 100, T_a = 25ºC)

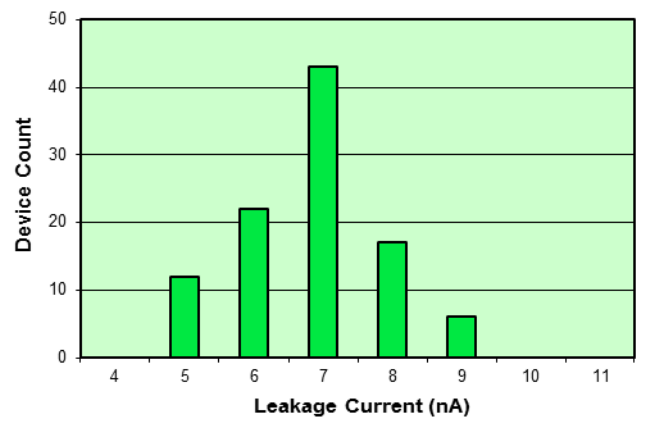


Figure 5: *Typical Blocking Voltage Distribution* (N = 100, Ta = 25ºC)

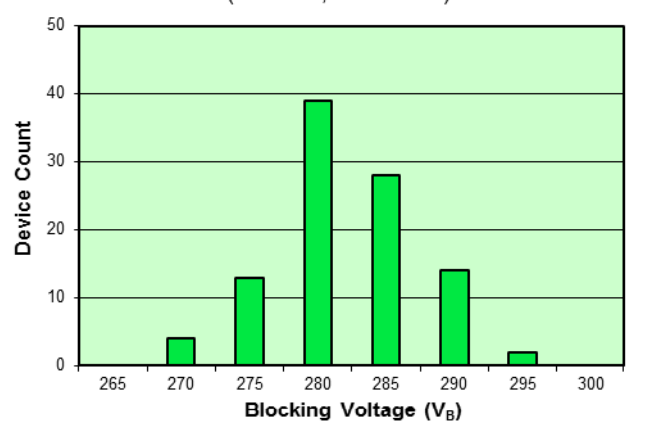
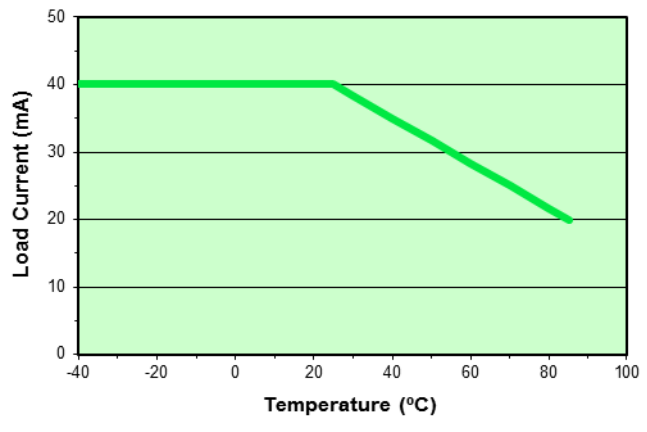


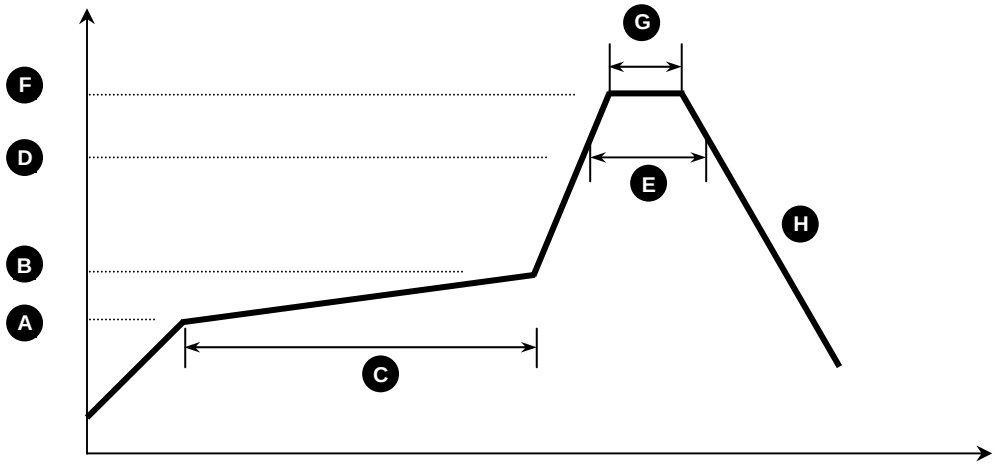
Figure 6: *Maximum Load Current vs. Temperature*



SMQ4110 Solder Reflow Temperature Profile Recommendations

(1) *Infrared Reflow:*

Refer to the following figure as an example of an optimal temperature profile for single occurrence infrared reflow. Soldering process should not exceed temperature or time limits expressed herein. Surface temperature of device package should not exceed 250ºC:



Process Step	Description	Parameter
A	Preheat Start Temperature (ºC)	150ºC
B	Preheat Finish Temperature (ºC)	180ºC
C	Preheat Time (s)	90 - 120s
D	Melting Temperature (ºC)	230ºC
E	Time above Melting Temperature (s)	30s
F	Peak Temperature, at Terminal (ºC)	260ºC
G	Dwell Time at Peak Temperature (s)	10s
H	Cool-down (ºC/s)	<6ºC/s

(2) *Wave Solder:*

Maximum Temperature:	260ºC (at terminal)
Maximum Time:	10s
Pre-heating:	100 - 150ºC (30 - 90s)
Single Occurrence	

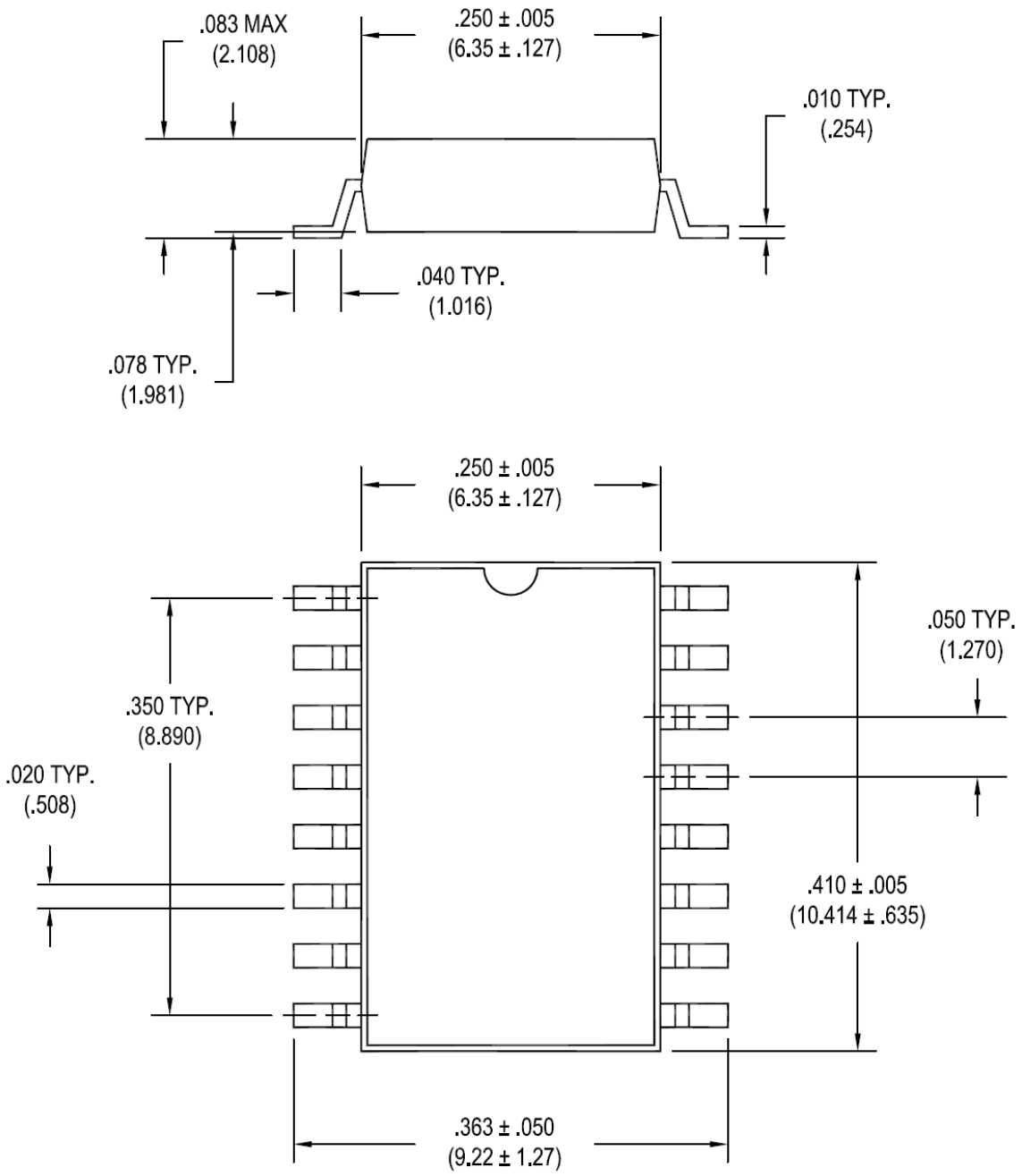
(3) *Hand Solder:*

Maximum Temperature:	350ºC (at tip of soldering iron)
Maximum Time:	3s
Single Occurrence	

SMQ4110 Package Dimensions

16 PIN SOIC Package

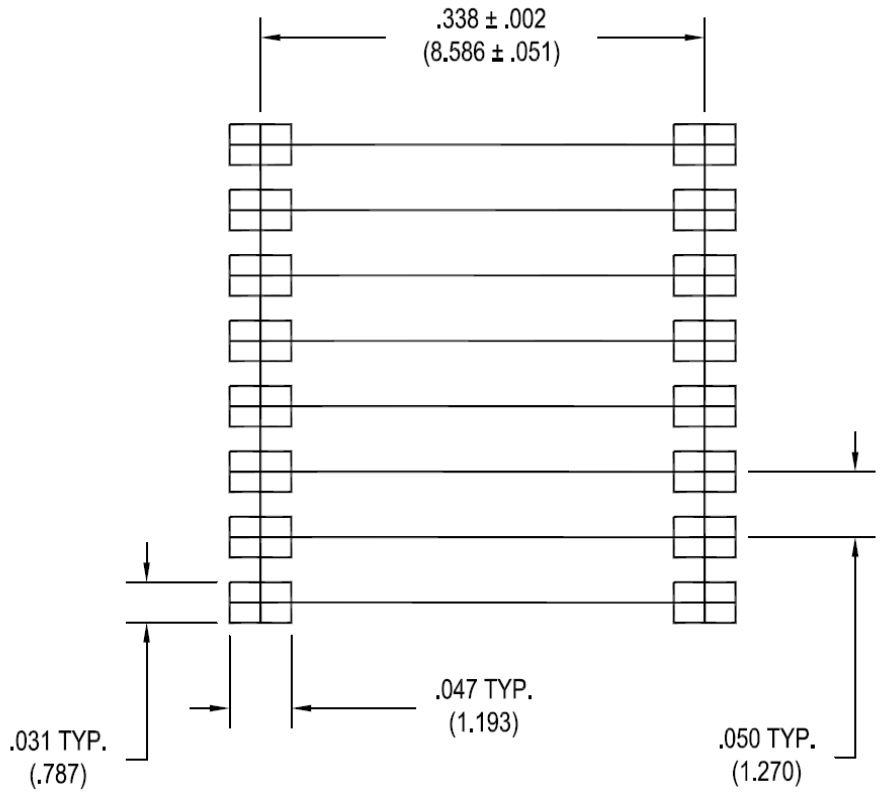
Note: *All dimensions in inches ["] with millimeters in parenthesis (mm)*



SMQ4110 Package Dimensions

16 PIN SOIC Footprint

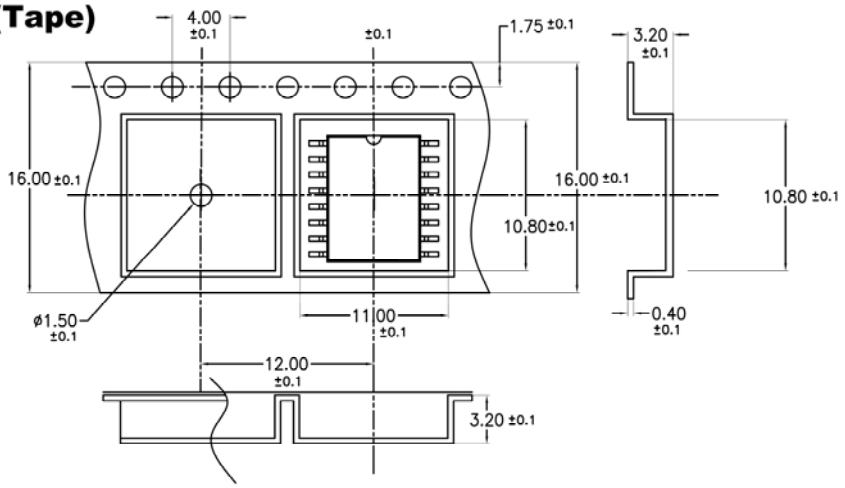
Note: *All dimensions in inches ["] with millimeters in parenthesis (mm)*



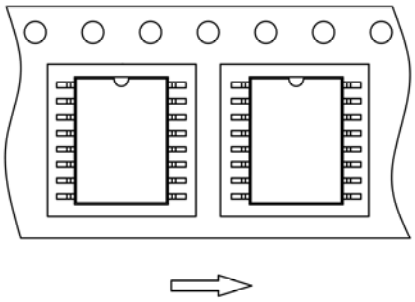
SMQ4110 Package Dimensions

TAPING SPECIFICATIONS (in millimeters)

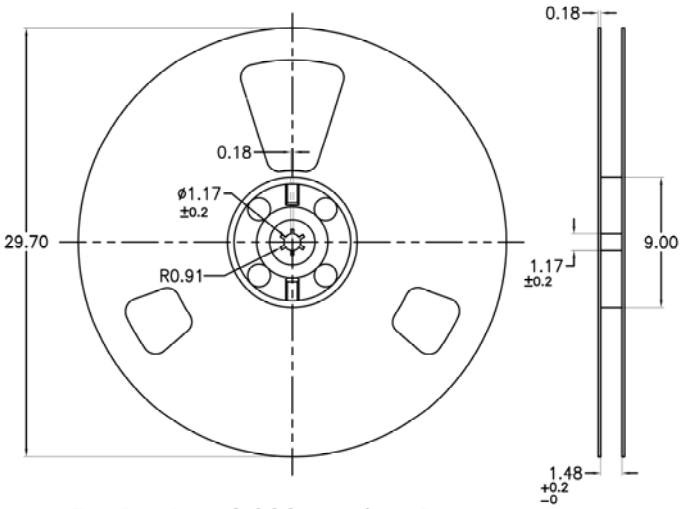
Outline and Dimension (Tape)



Parts Orientation and Tape Direction

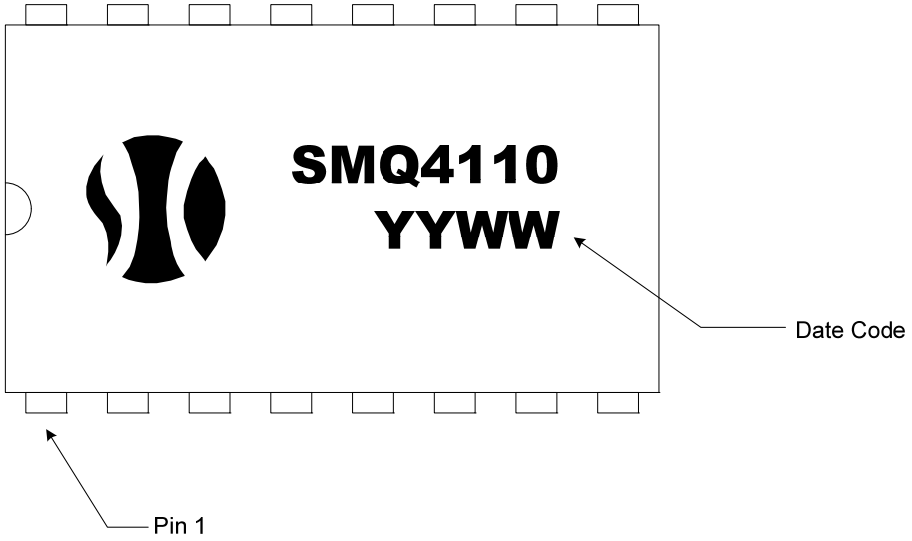


Outline and Dimensions (Reel)



Packaging: 1,000 pcs / reel

SMQ4110 Package Marking



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